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证　　明

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申　请　日：　2004.07.17

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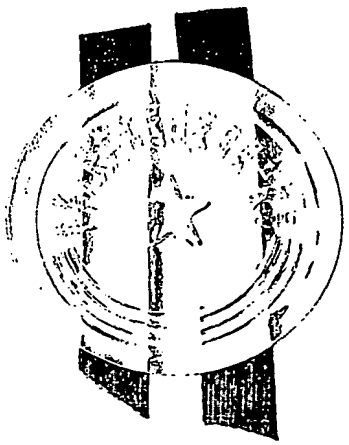
申请类别：　实用新型

发明创造名称：　水处理系统用多路阀

申　请　人：　温州市润新机械制造有限公司

发明人或设计人：　伍孝荣、丁锋阳、杨润德



中华人民共和国
国家知识产权局局长　王景川

2005 年 4 月 11 日

文字断线

权 利 要 求 书

1、一种水处理系统用多路阀，包括设有进水口、出水口和污水出口的阀体，和阀杆连接的阀芯置于阀体中，阀体中还设有流道和水处理系统滤芯的内部及外部分别连通，其特征为：阀芯采用一对端面转动密封配合的动阀片（3）和定阀片（2），动阀片（3）连接在阀杆（4）上，定阀片（2）端面中心设有通孔（8）连通阀体（1）的污水出口（7），定阀片（2）上还绕中心设有四个通孔（9）、（10）、（11）和（12），分别对应连通滤芯（18）的外部、滤芯（18）的内部、出水口（6）、滤芯（18）的内部；动阀片（3）的密封配合面上设有一个从中心到接近边缘的径向的盲孔（13），并设有一个绕中心的圆弧状盲孔（14），动阀片（3）同时还设有一个通孔（15）常通进水口（5）；定阀片（2）和动阀片（3）的各孔分布在同一回转圆半径上配合。

2、根据权利要求 1 所述的水处理系统用多路阀，其特征为：阀体（1）中的进水口（5）到水处理系统滤芯（18）的外部间的流道设有支路流道（16），该支路流道（16）中置有射流喷嘴（17），在该射流喷嘴（17）处的阀体（1）上开有盐水进口（20）和水处理系统的盐水罐（21）相应连接。

6

说　明　书

水处理系统用多路阀

技术领域：本实用新型涉及一种水处理系统用的多路阀。

背景技术：现在的工业或家用水处理系统都必须用多路阀进行切换，实现软化、净化、冲洗、反冲洗等功能。有些多路阀是将多个阀门集成到一个阀体中，结构复杂，制造麻烦，而且操作不方便，体积大，安装不便。还有些多路阀利用密封活塞在密封腔内移动，通过停留阻塞位置连通不同的流道控制水流，这种结构容易使连通流道出错混流，影响水处理的质量效果，而且也不易操作，达不到人们的要求。

发明内容：针对现有技术的不足，本实用新型提供一种结构紧凑，操作方便的水处理系统用多路阀。

本实用新型包括设有进水口、出水口和污水出口的阀体，和阀杆连接的阀芯置于阀体中，阀体中还设有流道和水处理系统滤芯的内部及外部分别连通，阀芯采用一对端面转动密封配合的动阀片和定阀片，动阀片连接在阀杆上，定阀片端面中心设有通孔连通阀体的污水出口，定阀片上还绕中心设有四个通孔，分别对应连通滤芯的外部、滤芯的内部、出水口、滤芯的内部；动阀片的密封配合面上设有一个从中心到接近边缘的径向的盲孔，并设有一个绕中心的圆弧状盲孔，动阀片同时还设有一个通孔常通进水口；定阀片和动阀片的各孔分布在同一回转圆半径上配合。

使用时，手动或者电动使动阀片转动，通过动、定阀片上的各不同通孔或者盲孔的相对重叠位置切换配合，即可实现软化或净化、反冲洗等不同控制状态，操作非常清楚方便，而且结构紧凑，容易制造，安装方便，各种工业或家用水处理系统均能使用，提高水处理质量。

下面结合附图和实施例进一步说明本实用新型。

附图说明：图 1 是阀体的俯视示意图；

图 2 是定阀片的俯视图；

图 3 是动阀片的俯视图；

图 4 是实施例在软化或净化状态的结构示意图；

图 5 是图 4 中定、动阀片配合状态示意图；

图 6 是实施例在反冲洗状态的结构示意图；

图 7 是图 6 中定、动阀片配合状态示意图；
图 8 是实施例在吸盐再生状态的结构示意图；
图 9 是图 8 中定、动阀片配合状态示意图；
图 10 是实施例在正冲洗状态的结构示意图；
图 11 是图 10 中定、动阀片配合状态示意图；
图 12 是实施例软化并向盐水罐加水状态的结构示意图；
图 13 是图 4 中净化状态的另一结构示意图。

实施例：如图 1 至图 3 所示，阀体 1 上设有进水口 5、出水口 6 和污水出口 7，阀体 1 中还设有流道和水处理系统滤芯 18 的内部及外部分别连通。阀体 1 的阀芯采用一对端面转动密封配合的动阀片 3 和定阀片 2，动阀片 3 连接在阀杆 4 上。定阀片 2 端面中心设有通孔 8 连通阀体 1 的污水出口 7，定阀片 2 上还绕中心设有四个通孔 9、10、11 和 12，分别对应连通滤芯 18 的外部、滤芯 18 的内部、出水口 6、滤芯 18 的内部。动阀片 3 的密封配合面上设有一个从中心到接近边缘的径向的盲孔 13，并设有一个绕中心的圆弧状盲孔 14，动阀片 3 同时还设有一个通孔 15 常通进水口 5。定阀片 2 和动阀片 3 的各孔分布在同一回转圆半径上配合。在生产时，定阀片 2 和动阀片 3 可采用陶瓷等不同材料，如果强度不高，可以在一些较大的通孔中，如定阀片 2 的通孔 9 和 10 中设有分隔加强条，提高强度。

使用时，阀体 1 安装在水处理罐 19 上，滤芯 18 设在水处理罐 19 内，或者在水处理罐 19 内直接填充过滤材料构成滤芯 18，阀体 1 和滤芯 18 内部连通的流道一般通过水处理罐 19 的布水器 22。如果需要进行净化，一般使用活性碳材料的滤芯 18，需要软化则一般使用树脂材料的滤芯 18。操作时可手动或者电动，工业水处理系统较多使用自动电机驱动方式转动阀杆 4，使动阀片 3 和定阀片 2 上的各孔配合位置变换，进行不同使用状态切换。

下面通过使用树脂材料的滤芯 18 的水处理系统说明本实施例各个工作使用状态。树脂材料再生时需要加盐水，可在阀体 1 中的进水口 5 到滤芯 18 的外部间的流道设有支路流道 16，该支路流道 16 中置有射流喷嘴 17，在该射流喷嘴 17 处的阀体 1 上开有盐水进口 20 和水处理系统的盐水罐 21 相应，盐水罐 21 可以通过一个进水阀 23 连通盐水进口 20。

当正常运行软化时，如图 4 和图 5 所示，动阀片 3 的通孔 15 重叠连通定阀片 2 的通孔 9，盲孔 14 覆盖在通孔 10 和 11 上，使通孔 10 和 11

连通。从进水口 5 进入的水流经通孔 15 进入通孔 9，再进入水处理罐 19 内，经过滤芯 18 软化过滤再经布水器 22 从通孔 10 出来，经盲孔 14 导流到通孔 11 后从出水口 6 流出。此过程中水流正常流过进水口 5 到滤芯 18 外部间的流道，支路流道 16 中的射流喷嘴 17 无射流，盐水罐 21 中有足够盐水，盐水进口 20 和盐水罐 21 无压差，进水阀 23 关闭，不会吸入盐水。

当反冲洗时，如图 6 和图 7 所示，动阀片 3 的通孔 15 重叠连通定阀片 2 的通孔 10，盲孔 13 则覆盖连通定阀片 2 上的通孔 8 和 9，这样水流从通孔 15 经通孔 10 进入布水器 22 到达滤芯 18 内部，然后反冲出滤芯 18 成为污水，再进入通孔 9 经盲孔 13 导流至通孔 8，从污水出口 7 排出。

当需要吸盐再生时，如图 8 和图 9 所示，动阀片 3 的通孔 15 重叠连通定阀片 2 的通孔 11，盲孔 13 则覆盖连通定阀片 2 上的通孔 8 和 10，从进水口 5 进入的水流大都经过通孔 15 进入到通孔 11 后，从出水口 6 直接流出。部分水流会经过支路流道 16 流到水处理罐 19，此过程中水流需经过射流喷嘴 17 射流，产生负压，盐水从盐水罐 21 中通过进水阀 23 经盐水进口 20 吸入支路流道 16，流到水处理罐 19 中，盐水流过滤芯 18 经布水器 22 到通孔 10，经盲孔 13 导流至通孔 8，从污水出口 7 排出。盐水罐 21 的水位下降到设定处，进水阀 23 会关闭。

当吸盐完成后，需要正冲洗时，如图 10 和图 11 所示，动阀片 3 的通孔 15 重叠连通定阀片 2 的通孔 9，盲孔 13 则覆盖连通定阀片 2 上的通孔 8 和 12，这样水流从通孔 15 经通孔 9 流到入滤芯 18，然后冲洗将残余盐水冲出滤芯 18 经布水器 22 到通孔 12，经盲孔 13 导流至通孔 8，从污水出口 7 排出。

当正冲洗完成，需要正常运行软化时，此状态的软化过程如图 4 和图 5 所示状态一样，由于盐水罐 21 中盐水已经使用，盐水进口 20 和盐水罐 21 有压差，如图 12 所示，部分水流经支路流道 16 和盐水进口 20 进入盐水罐 21 加水，水量足够时，进水阀 23 会关闭。向盐水罐 21 加盐后即可供再生吸盐，非常的方便。

当水处理罐 19 中采用活性碳材料的滤芯 18 时，不需要吸盐再生，如图 13 所示，可将盐水进口 20 阻塞，正常运行净化、反冲洗、正冲洗的各个工作状态过程和上述过程基本一致。生产时，也可以不在阀体 1 中设支路流道 16、射流喷嘴 17 和盐水进口 20，结构更加简化。

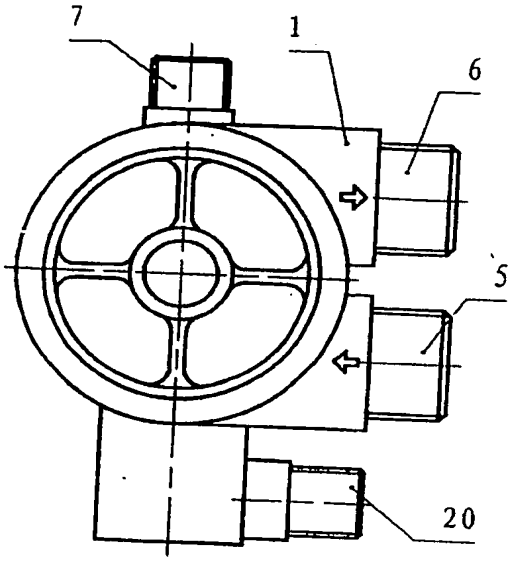

7
1
6
5
20

图 1

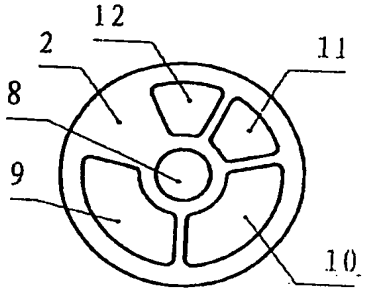

12
2
11
8
9
10

图 2

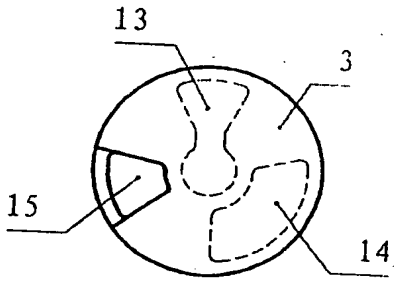

13
3
15
14

图 3

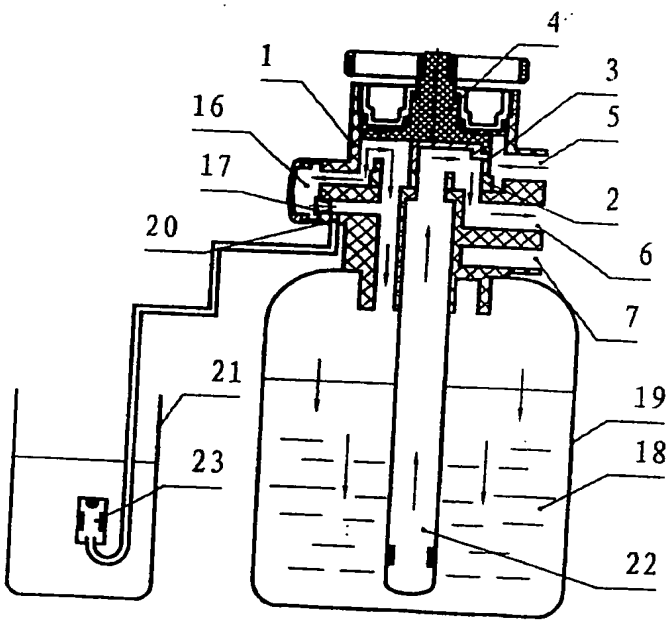

4
1
3
16
5
17
2
20
6
7
21
19
23
18
22

图 4

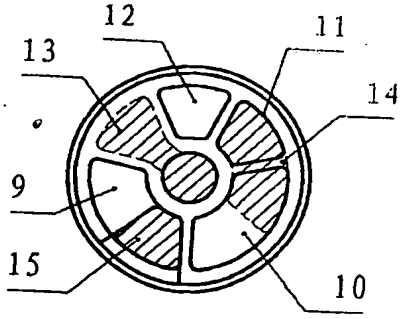

12
11
13
14
9
15
10

图 5

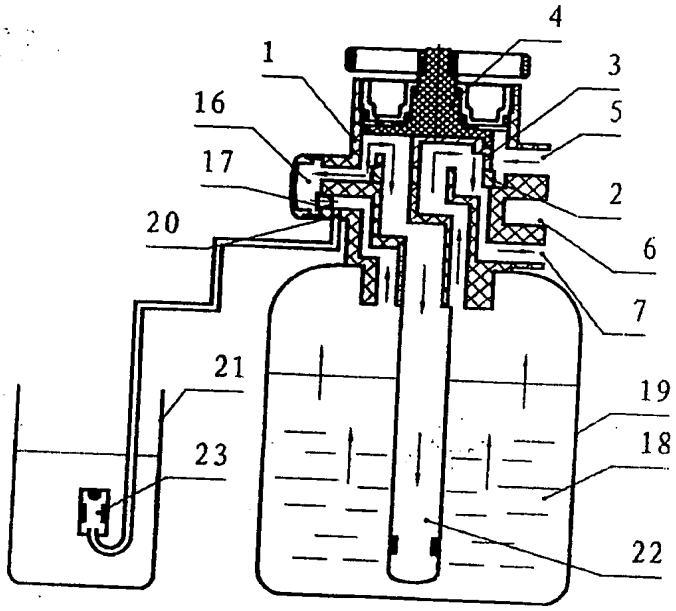

4
1
3
16
5
17
2
20
6
7
21
19
23
18
22

图. 6

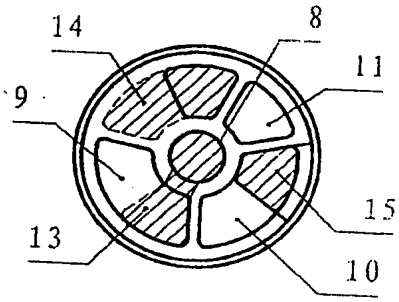

14
8
11
9
15
13
10

图 7

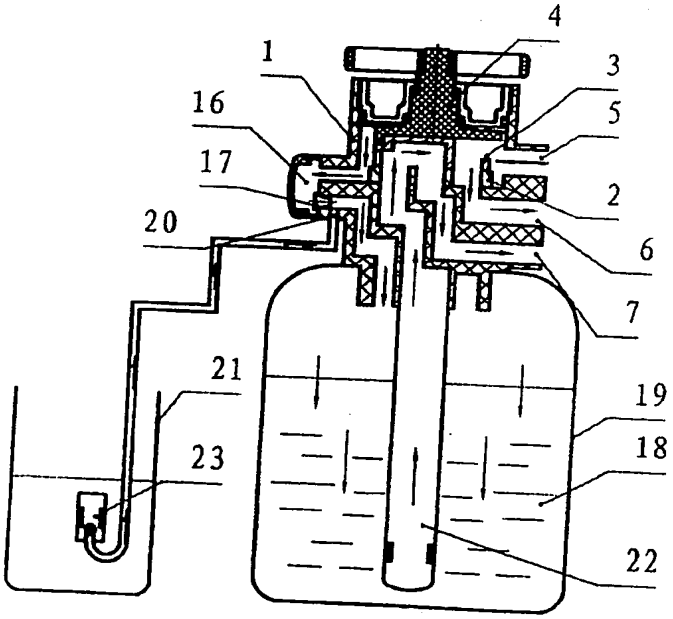

4
1
3
16
5
17
2
20
6
7
21
19
23
18
22

图 8

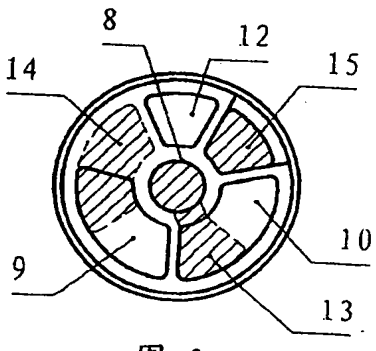

8
12
14
15
10
9
13

图 9

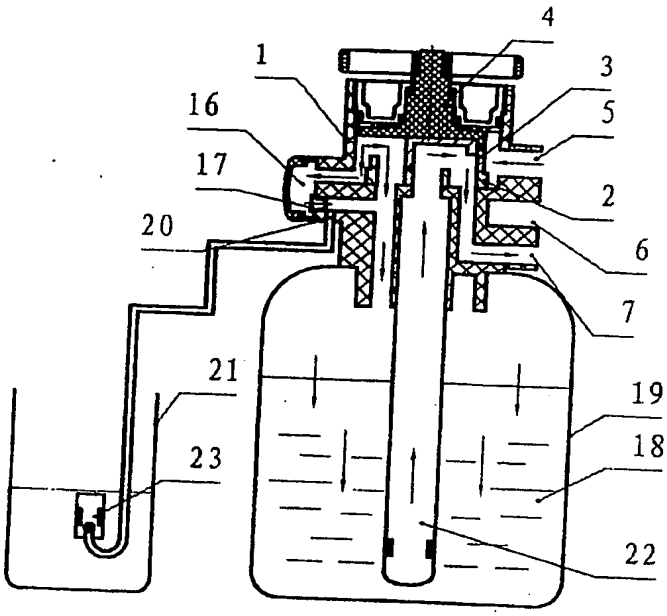


图 10

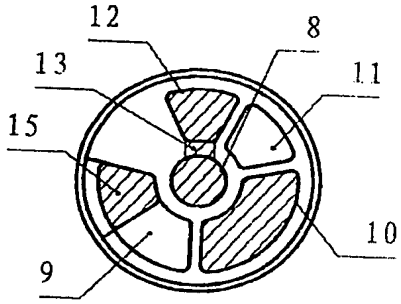


图 11

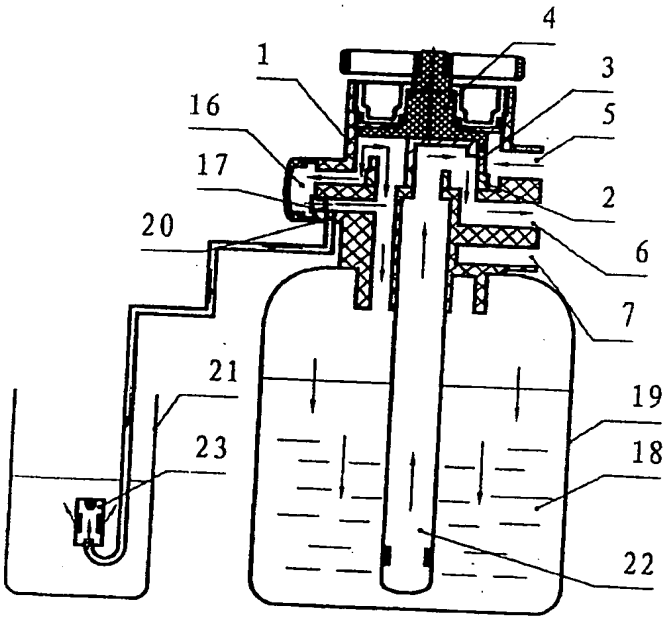


图 12

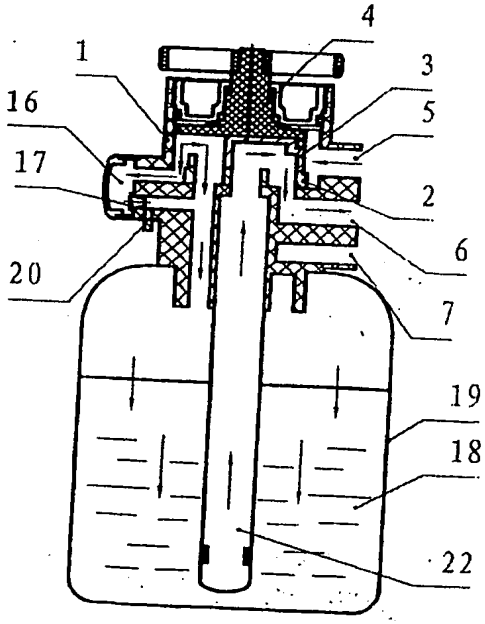


图 13

[19] 中华人民共和国国家知识产权局

[51] Int. Cl[7]
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[12] 实用新型专利说明书

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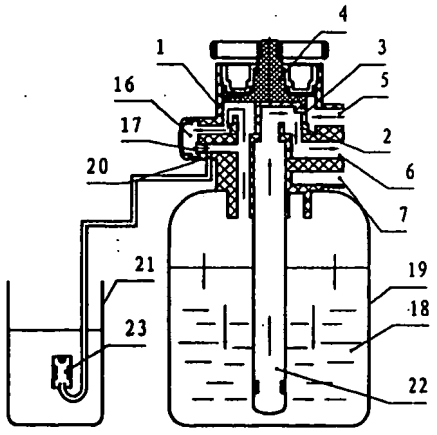
权利要求书 1 页 说明书 3 页 附图 3 页

[54] 实用新型名称 水处理系统用多路阀

[57] 摘要

一种水处理系统用多路阀，包括阀体和一对端面转动密封配合的动阀片和定阀片，动阀片连接在阀杆上，定阀片端面中心设有通孔连通阀体的污水出口，定阀片上还绕中心设有四个通孔，分别对应连通滤芯的外部、滤芯的内部、出水口、滤芯的内部；动阀片的密封配合面上设有一个径向的盲孔，并设有一个绕中心的圆弧状盲孔，同时还设有一个通孔常通进水口；定阀片和动阀片的各孔分布在同一回转圆半径上配合。使用时通过动、定阀片上的各不同通孔或者盲孔的相对重叠位置切换配合，即可实现软化或净化、反冲洗等不同控制状态，操作非常清楚方便，而且结构紧凑，安装方便，各种工业或家用水处理系统均能使用，提高水处理质量。



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1、一种水处理系统用多路阀，包括设有进水口、出水口和污水出口的阀体，和阀杆连接的阀芯置于阀体中，阀体中还设有流道和水处理系统滤芯的内部及外部分别连通，其特征为：阀芯采用一对端面转动密封配合的动阀片（3）和定阀片（2），动阀片（3）连接在阀杆（4）上，定阀片（2）端面中心设有通孔（8）连通阀体（1）的污水出口（7），定阀片（2）上还绕中心设有四个通孔（9）、（10）、（11）和（12），分别对应连通滤芯（18）的外部、滤芯（18）的内部、出水口（6）、滤芯（18）的内部；动阀片（3）的密封配合面上设有一个从中心到接近边缘的径向的盲孔（13），并设有一个绕中心的圆弧状盲孔（14），动阀片（3）同时还设有一个通孔（15）常通进水口（5）；定阀片（2）和动阀片（3）的各孔分布在同一回转圆半径上配合。

2、根据权利要求1所述的水处理系统用多路阀，其特征为：阀体（1）中的进水口（5）到水处理系统滤芯（18）的外部间的流道设有支路流道（16），该支路流道（16）中置有射流喷嘴（17），在该射流喷嘴（17）处的阀体（1）上开有盐水进口（20）和水处理系统的盐水罐（21）相应连接。

水处理系统用多路阀

技术领域：本实用新型涉及一种水处理系统用的多路阀。

背景技术：现在的工业或家用水处理系统都必须用多路阀进行切换，实现软化、净化、冲洗、反冲洗等功能。有些多路阀是将多个阀门集成到一个阀体中，结构复杂，制造麻烦，而且操作不方便，体积大，安装不便。还有些多路阀利用密封活塞在密封腔内移动，通过停留阻塞位置连通不同的流道控制水流，这种结构容易使连通流道出错混流，影响水处理的质量效果，而且也不易操作，达不到人们的要求。

发明内容：针对现有技术的不足，本实用新型提供一种结构紧凑，操作方便的水处理系统用多路阀。

本实用新型包括设有进水口、出水口和污水出口的阀体，和阀杆连接的阀芯置于阀体中，阀体中还设有流道和水处理系统滤芯的内部及外部分别连通，阀芯采用一对端面转动密封配合的动阀片和定阀片，动阀片连接在阀杆上，定阀片端面中心设有通孔连通阀体的污水出口，定阀片上还绕中心设有四个通孔，分别对应连通滤芯的外部、滤芯的内部、出水口、滤芯的内部；动阀片的密封配合面上设有一个从中心到接近边缘的径向的盲孔，并设有一个绕中心的圆弧状盲孔，动阀片同时还设有一个通孔常通进水口；定阀片和动阀片的各孔分布在同一回转圆半径上配合。

使用时，手动或者电动使动阀片转动，通过动、定阀片上的各不同通孔或者盲孔的相对重叠位置切换配合，即可实现软化或净化、反冲洗等不同控制状态，操作非常清楚方便，而且结构紧凑，容易制造，安装方便，各种工业或家用水处理系统均能使用，提高水处理质量。

下面结合附图和实施例进一步说明本实用新型。

附图说明：图 1 是阀体的俯视示意图；

图 2 是定阀片的俯视图；

图 3 是动阀片的俯视图；

图 4 是实施例在软化或净化状态的结构示意图；

图 5 是图 4 中定、动阀片配合状态示意图；

图 6 是实施例在反冲洗状态的结构示意图；

图 7 是图 6 中定、动阀片配合状态示意图；

图 8 是实施例在吸盐再生状态的结构示意图；

图 9 是图 8 中定、动阀片配合状态示意图；

图 10 是实施例在正冲洗状态的结构示意图；

图 11 是图 10 中定、动阀片配合状态示意图；

图 12 是实施例软化并向盐水罐加水状态的结构示意图；

图 13 是图 4 中净化状态的另一结构示意图。

实施例：如图 1 至图 3 所示，阀体 1 上设有进水口 5、出水口 6 和污水出口 7，阀体 1 中还设有流道和水处理系统滤芯 18 的内部及外部分别连通。阀体 1 的阀芯采用一对端面转动密封配合的动阀片 3 和定阀片 2，动阀片 3 连接在阀杆 4 上。定阀片 2 端面中心设有通孔 8 连通阀体 1 的污水出口 7，定阀片 2 上还绕中心设有四个通孔 9、10、11 和 12，分别对应连通滤芯 18 的外部、滤芯 18 的内部、出水口 6、滤芯 18 的内部。动阀片 3 的密封配合面上设有一个从中心到接近边缘的径向的盲孔 13，并设有一个绕中心的圆弧状盲孔 14，动阀片 3 同时还设有一个通孔 15 常通进水口 5。定阀片 2 和动阀片 3 的各孔分布在同一回转圆半径上配合。在生产时，定阀片 2 和动阀片 3 可采用陶瓷等不同材料，如果强度不高，可以在一些较大的通孔中，如定阀片 2 的通孔 9 和 10 中设有分隔加强条，提高强度。

使用时，阀体 1 安装在水处理罐 19 上，滤芯 18 设在水处理罐 19 内，或者在水处理罐 19 内直接填充过滤材料构成滤芯 18，阀体 1 和滤芯 18 内部连通的流道一般通过水处理罐 19 的布水器 22。如果需要进行净化，一般使用活性碳材料的滤芯 18，需要软化则一般使用树脂材料的滤芯 18。操作时可手动或者电动，工业水处理系统较多使用自动电机驱动方式转动阀杆 4，使动阀片 3 和定阀片 2 上的各孔配合位置变换，进行不同使用状态切换。

下面通过使用树脂材料的滤芯 18 的水处理系统说明本实施例各个工作使用状态。树脂材料再生时需要加盐水，可在阀体 1 中的进水口 5 到滤芯 18 的外部间的流道设有支路流道 16，该支路流道 16 中置有射流喷嘴 17，在该射流喷嘴 17 处的阀体 1 上开有盐水进口 20 和水处理系统的盐水罐 21 相应，盐水罐 21 可以通过一个进水阀 23 连通盐水进口 20。

当正常运行软化时，如图 4 和图 5 所示，动阀片 3 的通孔 15 重叠连通定阀片 2 的通孔 9，盲孔 14 覆盖在通孔 10 和 11 上，使通孔 10 和 11

连通。从进水口 5 进入的水流经通孔 15 进入通孔 9，再进入水处理罐 19 内，经过滤芯 18 软化过滤再经布水器 22 从通孔 10 出来，经盲孔 14 导流到通孔 11 后从出水口 6 流出。此过程中水流正常流过进水口 5 到滤芯 18 外部间的流道，支路流道 16 中的射流喷嘴 17 无射流，盐水罐 21 中有足够盐水，盐水进口 20 和盐水罐 21 无压差，进水阀 23 关闭，不会吸入盐水。

当反冲洗时，如图 6 和图 7 所示，动阀片 3 的通孔 15 重叠连通定阀片 2 的通孔 10，盲孔 13 则覆盖连通定阀片 2 上的通孔 8 和 9，这样水流从通孔 15 经通孔 10 进入布水器 22 到达滤芯 18 内部，然后反冲出滤芯 18 成为污水，再进入通孔 9 经盲孔 13 导流至通孔 8，从污水出口 7 排出。

当需要吸盐再生时，如图 8 和图 9 所示，动阀片 3 的通孔 15 重叠连通定阀片 2 的通孔 11，盲孔 13 则覆盖连通定阀片 2 上的通孔 8 和 10，从进水口 5 进入的水流大都经过通孔 15 进入到通孔 11 后，从出水口 6 直接流出。部分水流会经过支路流道 16 流到水处理罐 19，此过程中水流需经过射流喷嘴 17 射流，产生负压，盐水从盐水罐 21 中通过进水阀 23 经盐水进口 20 吸入支路流道 16，流到水处理罐 19 中，盐水流过滤芯 18 经布水器 22 到通孔 10，经盲孔 13 导流至通孔 8，从污水出口 7 排出。盐水罐 21 的水位下降到设定处，进水阀 23 会关闭。

当吸盐完成后，需要正冲洗时，如图 10 和图 11 所示，动阀片 3 的通孔 15 重叠连通定阀片 2 的通孔 9，盲孔 13 则覆盖连通定阀片 2 上的通孔 8 和 12，这样水流从通孔 15 经通孔 9 流到入滤芯 18，然后冲洗将残余盐水冲出滤芯 18 经布水器 22 到通孔 12，经盲孔 13 导流至通孔 8，从污水出口 7 排出。

当正冲洗完成，需要正常运行软化时，此状态的软化过程如图 4 和图 5 所示状态一样，由于盐水罐 21 中盐水已经使用，盐水进口 20 和盐水罐 21 有压差，如图 12 所示，部分水流经支路流道 16 和盐水进口 20 进入盐水罐 21 加水，水量足够时，进水阀 23 会关闭。向盐水罐 21 加盐后即可供再生吸盐，非常的方便。

当水处理罐 19 中采用活性碳材料的滤芯 18 时，不需要吸盐再生，如图 13 所示，可将盐水进口 20 阻塞，正常运行净化、反冲洗、正冲洗的各个工作状态过程和上述过程基本一致。生产时，也可以不在阀体 1 中设支路流道 16、射流喷嘴 17 和盐水进口 20，结构更加简化。

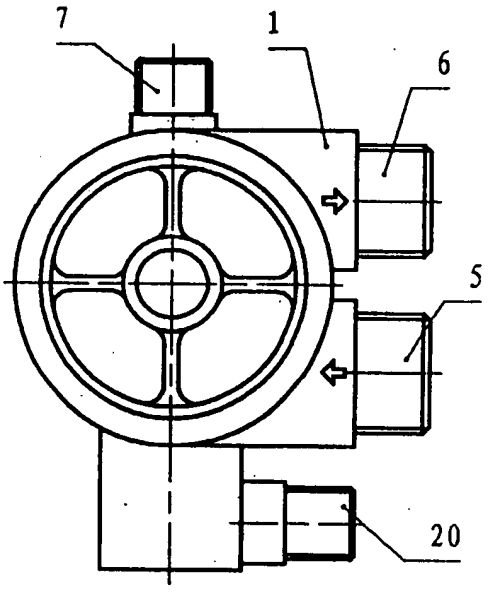
7
1
6
5
20

图 1

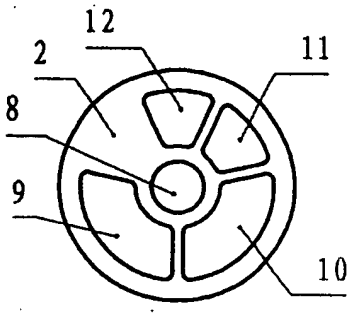
12
2
11
8
9
10

图 2

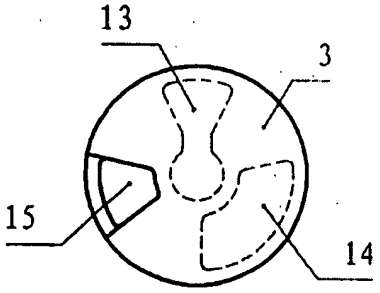
13
3
15
14

图 3

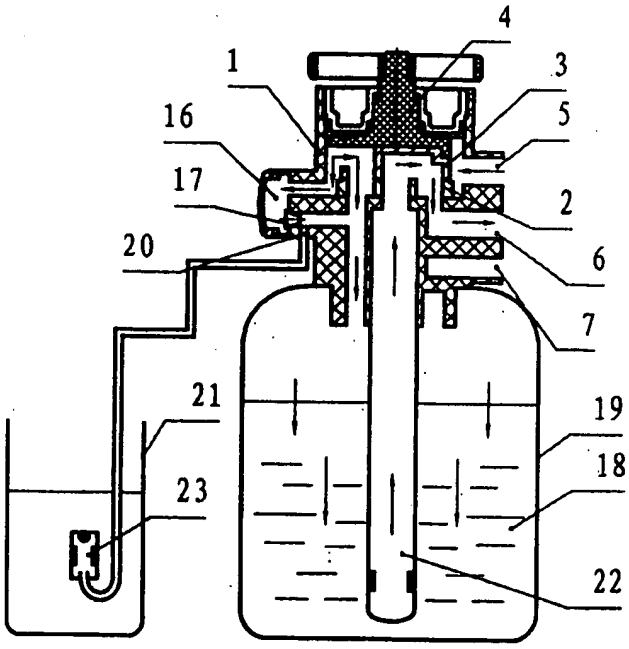
4
1
3
16
5
17
2
20
6
7
21
19
18
23
22

图 4

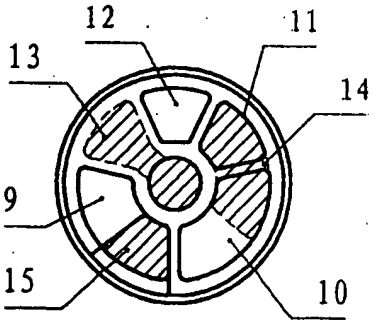
12
11
13
14
9
15
10

图 5

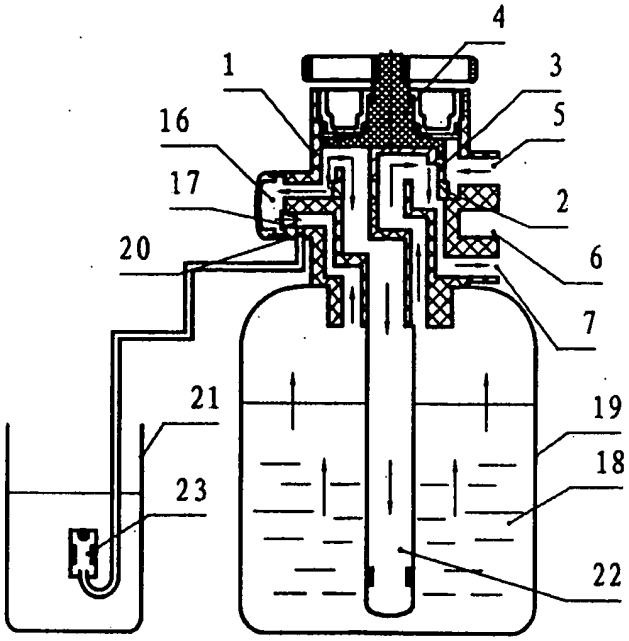
4
1
3
16
5
17
2
20
6
7
21
19
18
23
22

图 6

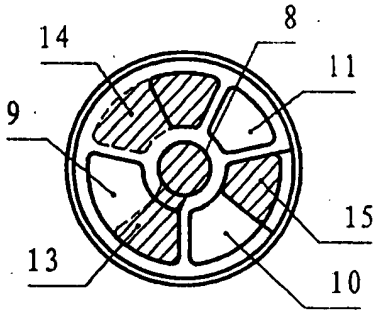
8
14
11
9
15
13
10

图 7

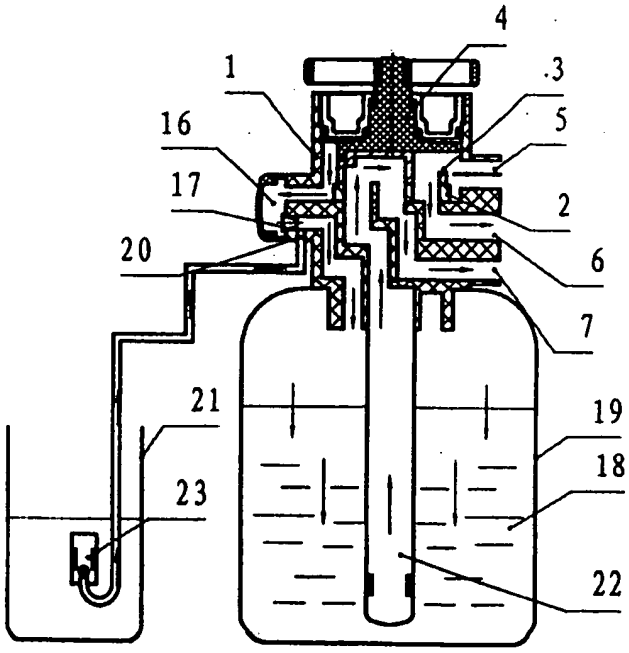
4
1
3
16
5
17
2
20
6
7
21
19
18
23
22

图 8

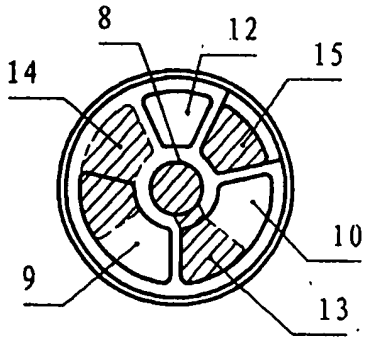
8
12
15
14
10
9
13

图 9

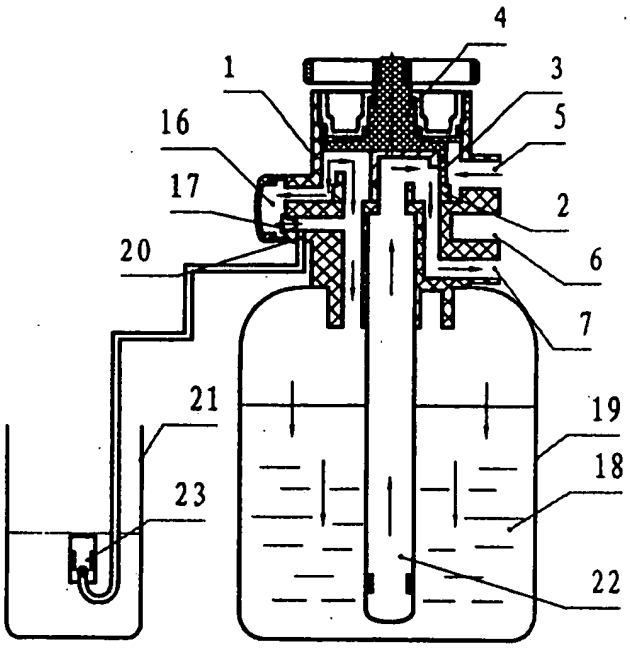

图 10

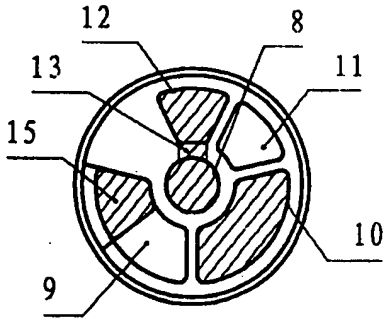

图 11

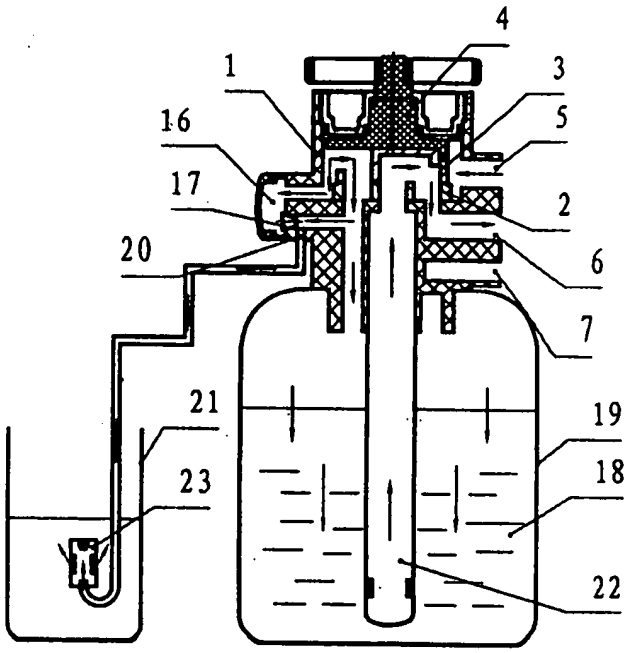

图 12

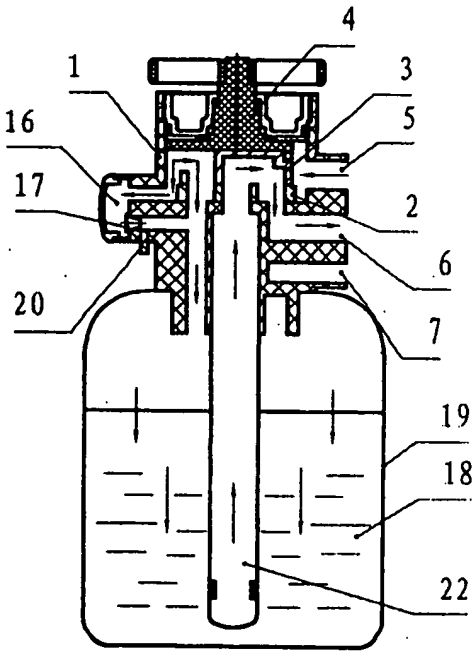

图 13

SPECIFICATION

MULTI-FUNCTIONAL FLOW CONTROL VALVE FOR WATER TREATMENT SYSTEMS

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This invention relates to a multi-functional flow control valve for water treatment systems.

2. Description of the Prior Art

[0002] All existing industrial and household water treatment systems depend on switching function of multi-functional flow control valves for the purposes of softening, purification, backwash and regeneration of effluent. Typical of the valves on current market are Fleck valves and Autotrol valves. The Fleck valve, produced by Pentair, Inc., USA, has several layers of seal rings in a valve body thereof, which are separated by several working of plastics, thereby allowing space therebetween. The seal rings are sealed against the valve body on an external side thereof and against a cylinder encapsulated piston on an internal side thereof. The encapsulated piston is drawn up and down and positioned at different positions to form different flow channels. That is, the performance of the multi-port valve is realized by the encapsulated piston being placed at different positions along the axis. The Autotrol valve, produced by Autotrol Corporation, also in USA, has several valves arranged along a band in a valve body thereof. A cam rotor axis with several cams at different angles is worked by an engine. As the cam rotor axis rotates, the cams at different angles are open to certain ports but closed to others, thereby to realize different flow channels and the desired functions.

[0003] Apparently, some types of multi-functional flow control valves exist. One combines several valves into one valve body, which results in a more complicated structure, difficulty in manufacturing, bigger size and inconvenience in installation. Another type of flow control valves connects several external valves and the flow is controlled by opening and closing different valves in different positions. This type is difficult to install and inconvenient to operate. The third type features the movements of the encapsulated piston in the sealed cavity. The flow is controlled and directed by locating the encapsulated piston in different positions. However, the problem with this structure is that the flows in those channels are easily mixed and thus undermine the treatment effect.

SUMMARY OF THE INVENTION

[0004] An object of the present invention is to provide a multi-functional flow control valve of water treatment systems which features a simplified and compact structure and easy operation for softening, purification, backwash and regeneration of effluent.

[0005] To achieve the above-mentioned object, a multi-functional flow control valve of water treatment systems developed employing the theory of hermetical head faces in accordance with a preferred embodiment of the present invention is provided. The valve includes a valve body having a water inlet port, a water outlet port and an effluent outlet. A valve core connected with a valve rod is placed inside the valve body. The valve body defines a flow channel therein for connecting with an inside and an outside of a filter element of the water treatment system, respectively. The valve core includes a moving valve disk and a fixed valve disk of which head faces are aligned hermetically rotationally. The moving valve disk is connected to the valve rod. The fixed valve disk defines a plurality of through holes therein which are connected to the water inlet port, the water outlet port and the effluent outlet, respectively. The moving valve disk defines a through hole and two blind recesses

therein. By rotating the moving valve disk, the through hole and the blind recesses in the moving valve disk are aligned with corresponding holes in the fixed valve disk for forming different liquid flow channel thereby realizing control of a flow. The through hole and the blind recesses in the moving valve disk and the plurality of through holes in the fixed valve disk are allocated on a same turning circle.

[0006] The principles for design of the invention is basically that different ports are allocated on a plane circle, and when the moving valve disk is rotated, some ports are opened and some are closed.

[0007] When under use, the moving valve disk is rotated manually or by an engine, and different controlled cycles of softening, backwash, regeneration, fast rinse, etc, are realized by aligning different through holes and blind recesses on the moving and the fixed valve disks. On a whole the present invention features easy operation, a compact structure, easy manufacturing, quick installation, a wide range of applications in various industrial and household water treatment systems and improved quality of water treatment.

[0008] The following are detailed description of this invention illustrated with drawings and embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figs. 1-14 are illustrations for a first embodiment of the present invention.

[0010] Fig. 1 is a top view of a valve body of the first embodiment.

[0011] Fig. 2 is a top view of a fixed valve disk of the first embodiment.

[0012] Fig. 3 is a top view of a moving valve disk of the first embodiment.

[0013] Fig. 4 is a structure diagram of the first embodiment in a softening and purification cycle.

[0014] Fig. 5 is a state diagram of the fixed and the moving valve disks in an aligned phase as shown in Fig. 4.

[0015] Fig. 6 is a structure diagram of the first embodiment in a backwash cycle.

[0016] Fig. 7 is a state diagram of the fixed and the moving valve disks in the aligned phase as shown in Fig. 6.

[0017] Fig. 8 is a structure diagram of the first embodiment in a regeneration cycle.

[0018] Fig. 9 is a state diagram of the fixed and the moving valve disks in the aligned phase as shown in Fig. 8.

[0019] Fig. 10 is a structure diagram of the first embodiment when a brine tank is being refilled, in accordance with the present invention.

[0020] Fig. 11 is a state diagram of the fixed and the moving valve disks in the aligned phase as shown in Fig. 10.

[0021] Fig. 12 is a structure diagram of the first embodiment in a fast rinse cycle, in accordance with the present invention.

[0022] Fig. 13 is another structure diagram of the first embodiment in an purification cycle.

DETAILED DESCRIPTION OF THE INVENTION

A first embodiment

[0042] Referring to Figs. 1-3, there are a water inlet port 5, a water outlet port 6 and an effluent outlet 7 in a valve body 1, which is connected separately to an inside

and an outside of a filter element 18 of a water treatment system through a flow channel. A leg flow channel 16 is formed in the flow channel from the water inlet port 5 to the filter element 18 and the leg flow channel 16 fixes an ejector nozzle 17 inside. A brine inlet port 20 is defined near the ejector nozzle 17 in the valve body 1, which may connect with a brine tank 21 of the water treatment system. A valve core of the valve body 1 includes a moving valve disk 3 and a fixed valve disk 2, of which head faces are aligned hermetically rotationally. The moving valve disk 3 is connected to a valve rod 4. The fixed valve disk 2 defines a through hole 8 in a center of the head face thereof to connect with the effluent outlet 7 of the valve body 1 and six through holes along a circle around the center of the head face thereof, among which a through hole 9 is connected to the outside of the filter element 18, through holes 10, 12 are connected to the inside of the filter element 18, a through hole 11 is connected to the water outlet port 6, and through holes 24 and 25 are connected to an inlet port and an outlet port of the ejector nozzle 17, respectively. The moving valve disk 3 forms a radial blind recess 13 from a center to an edge in the hermetical aligning head face thereof and a blind recess 14 shaped as a circular arc around the center in the hermetical aligning head face thereof. The moving valve disk 3 further forms a through hole 15 which permanently opens to the water inlet port 5. The holes and the blind recesses in the fixed valve disk 2 and the moving valve disk 3 are allocated along a same turning circle for the purpose of aligning. The fixed valve disk 2 and the moving valve disk 3 can be made of ceramics or other material. If the material is not hard enough, a separating bar can be placed within some bigger holes like the through holes 9 and 10 to strengthen the holes. The through holes 10 and 12 can be made into one hole, but it is more difficult to produce.

[0043] When in operation, the valve body 1 is fixed on a water treatment tank 19, and the filter element 18 is fixed in the water treatment tank 19, or filtering material can be placed directly in water treatment tank 19 instead of the filter element 18.

Normally a flow between the valve body 1 and the filter element 18 passes through a distributor 22 in the water treatment tank 19. The filter element 18 made from activated carbon or sand leach can be used for purification and the filter element 18 made from resin is used for softening. The system can be operated manually or by electricity. In most industrial water treatment systems, the valve rod 4 is worked by engines and a switching between different cycles is realized by a variation in the aligning positions of the different holes in the moving valve disk 3 and the fixed valve disk 2.

[0044] The following working process of the water treatment system using a resin filter element 18 is provided to illustrate the full range of working cycles of this embodiment. Brine or other regenerating material should be added for the regeneration of resin material. The water treatment system can be equipped with the brine tank 21 connecting with the brine inlet port 20 of the valve body 1 by a water inlet valve 23.

[0045] In a softening cycle, as shown in Figs. 4 and 5, the through hole 15 in the moving valve disk 3 is aligned with the through hole 9 in the fixed valve disk 2 and the blind recess 14 covers the through holes 10 and 11, which are thus connected. An inward water flow from the water inlet port 5 passes by the through hole 15 into the through hole 9, then into the water treatment tank 19. After filtered by the filter element 18, the water flow runs through the distributor 22, the through hole 10, the blind recess 14 and the through hole 11 before it flows out through the water outlet port 6. In this cycle when the water flow runs through the water inlet port 5 to the flow channel outside the filter element 18, the blind recess 13 covers the through holes 8 and 25, so no flow channel is formed and there is no flow in the leg flow channel 16.

[0046] In a backwash cycle, as shown in Figs. 6 and 7, the through hole 15 in the moving valve disk 3 is aligned with the through hole 10 in the fixed valve disk 2 and

the blind recess 13 covers the through holes 8 and 9 in the fixed valve disk 2. The water flow runs by the through holes 15 and 10, enters the distributor 22, reaches the inside of the filter element 18, then backwashes the residue accumulated in the filter element 18 and becomes waste water which passes through the blind recess 13 into the through hole 8 and outpours from the effluent outlet 7.

[0047] In a regeneration cycle through in-taking salt, as shown in Figs. 8 and 9, the through hole 15 in the moving valve disk 3 is aligned with the through hole 24 in the fixed valve disk 2 and the blind recess 14 covers the through holes 25 and 9, which are thus connected. The water flow from the water inlet port 5 passes by the through hole 15, enters the through hole 24, and jets out through the ejector nozzle 17 at the end of the leg flow channel 16. In this cycle, the water flow causes negative pressure at the outlet port of the ejector nozzle 17, i.e., the brine inlet port 20 of the valve body 1, after jetting. The brine in the brine tank 21 is in-taken by the brine inlet port 20 through the water inlet valve 23. The mixed flow of the brine and the water runs from the through hole 25 to the through hole 9 through the blind recess 14, then into the water treatment tank 19. The flow is regenerated through the filter element 18, passes the distributor 22 into the through hole 10, enters the through hole 8 via the blind recess 13 and outpours from the effluent outlet 7. When a water level of the brine tank 21 falls to a pre-defined point, the water inlet valve 23 shuts automatically.

[0048] After the brine in-taking cycle is completed, since the brine in the brine tank 21 has been used, water has to be added. As shown in Figs. 11 and 11, the through hole 15 in the moving valve disk 3 is aligned with the through hole 25 in the fixed valve disk 2 and the blind recess 13 covers the through holes 8 and 24, which are thus connected. The water flow reaches the outlet port of the ejector nozzle 17 from the through hole 15 through the through hole 25 and the leg flow channel 16. As the outlet port of the ejector nozzle 17 is thinner, most of the flow runs into the

brine tank 21 through the brine inlet port 20. When enough water accumulates, salt can be added into the brine tank 21 to provide the brine for regeneration. The whole process is easily done. A small portion of water flows back through the ejector nozzle 17 and the through hole 24, enters the through hole 8 via the blind recess 13, and outpours from the effluent outlet 7.

[0049] In a fast rinse cycle, as shown in Figs. 12 and 13, the through hole 15 in the moving valve disk 3 is aligned with the through hole 9 in the fixed valve disk 2 and the blind recess 13 covers the through holes 8 and 12 in the fixed valve disk 2. The water flow runs by the through holes 15 and 9, enters the filter element 18, and washes the residue brine out of the filter element 18. The residue brine runs through the distributor 22, the through hole 12, the blind recess 13 and the through hole 8 and outpours from the effluent outlet 7.

[0050] Only in a purification cycle, the filter element 18 made from activated carbon material or sand leach can be added into the water treatment tank 19, and no regeneration is needed. As shown in Fig. 14, the brine inlet port 20 can be blocked. Similar working procedures are followed for purification, backwash and fast rinse. In the course of production, the leg flow channel 16, the ejector nozzle 17 and the brine inlet port 20 can be omitted in the valve body 1 and the through hole 24 and the through hole 25 can also be omitted, which makes a simpler structure.

What is claimed is:

1. A multi-functional flow control valve for a water treatment system, comprising:

a valve body having a water inlet port, a water outlet port and a effluent outlet and defining a flow channel therein for connecting with an inside and an outside of a filter element of the water treatment system, respectively;

a valve core placed inside the valve body and including a moving valve disk and a fixed valve disk of which head faces are aligned hermetically rotationally, the moving valve disk defining a through hole and two blind recesses therein and the fixed valve disk defining a plurality of through holes therein which are connected to the water inlet port, the water outlet port and the effluent outlet, respectively; and

a valve rod connecting with the moving valve disk; wherein

by rotating the moving valve disk, the through hole and the blind recesses in the moving valve disk are aligned with corresponding holes in the fixed valve disk for forming different liquid flow channels for realizing control of a flow and the through hole and the blind recesses in the moving valve disk and the plurality of through holes in the fixed valve disk are allocated on a same turning circle.

2. The multi-functional flow control valve for a water treatment system as claimed in claim 1, wherein

the valve body defines a leg flow channel in the flow channel thereof from the water inlet port to the filter element, and the leg flow channel is permanently connected with the water inlet port;

an ejector nozzle is fixed in the leg flow channel;

a brine inlet port is defined at an outlet port of the ejector nozzle for connecting with a brine tank of the water treatment system; and

the valve core includes the moving valve disk and the fixed valve disk of which the head faces are aligned hermetically rotationally; wherein

the moving valve disk is connected to the valve rod;

the fixed valve disk defines a through hole in a center of the head face thereof to connect with the effluent outlet of the valve body, and four through holes around the center of the head face thereof, among which a through hole leads to the outside of the filter element, two through holes lead to the inside of the filter element, and the other through hole leads to the water outlet port; and

the moving valve disk defines radially one blind recess in the head face thereof from a center to an edge and defines the other blind recess shaped as circular arc around the center in the head face thereof, and the through hole in the moving valve disk permanently opens to the water inlet port.

ABSTRACT

A multi-functional flow control valve for a water treatment system includes a valve body having a water inlet port, a water outlet port and an effluent outlet. A valve core connected with a valve rod is placed inside the valve body. The valve body defines a flow channel therein for connecting with an inside and an outside of a filter element of the water treatment system, respectively. The valve core includes a moving valve disk and a fixed valve disk whose head faces are aligned hermetically rotationally. The moving valve disk is connected to the valve rod. The fixed valve disk defines a plurality of through holes which are connected to the water inlet port, the water outlet port and the effluent outlet, respectively. The moving valve disk defines a through hole and two blind recesses therein. By rotating the moving valve disk, the through hole and the blind recesses in the moving valve disk are aligned to corresponding holes in the fixed valve disk for forming different liquid flow channels thereby to realize control of a flow. The through hole and the blind recesses in the moving valve disk and the plurality of through holes in the fixed valve disk are allocated on the same turning circle. This invention realizes different controlled cycles of softening, purification, backwash and regeneration by changing the different aligning positions of the holes and the blind recesses in the moving and the fixed valve disks. Thus designed, the valve features easy operation and a compact structure, applicability for various industrial water treatment systems as well as household water treatment systems and improved quality of water treatment.

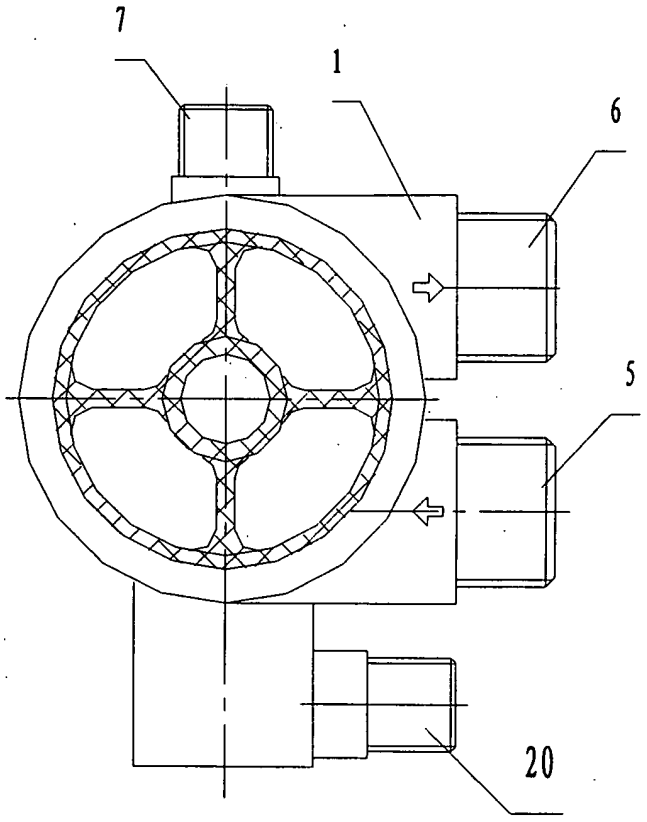

FIG. 1

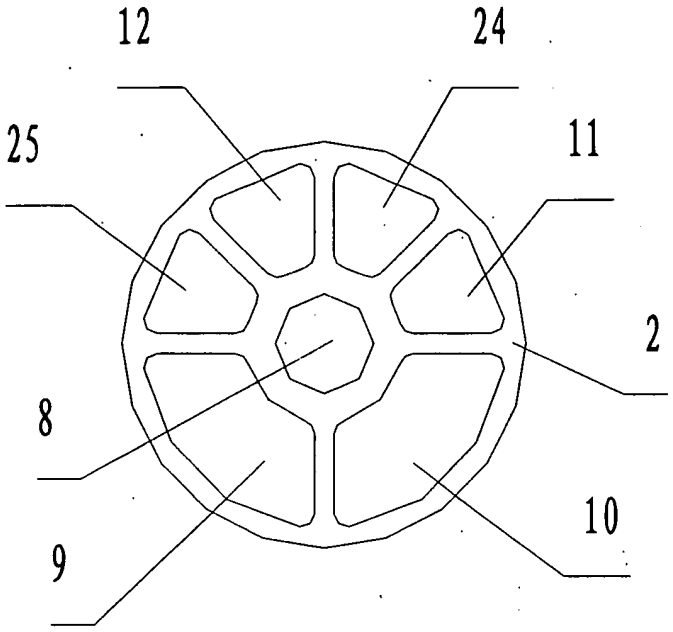

FIG. 2

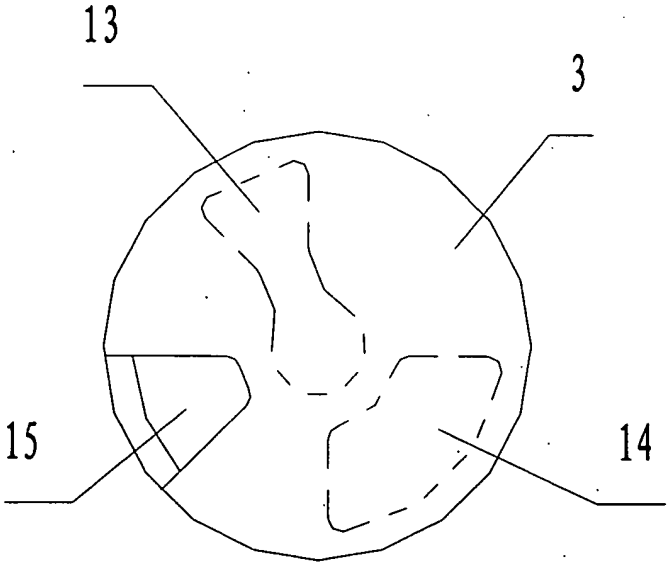

FIG. 3

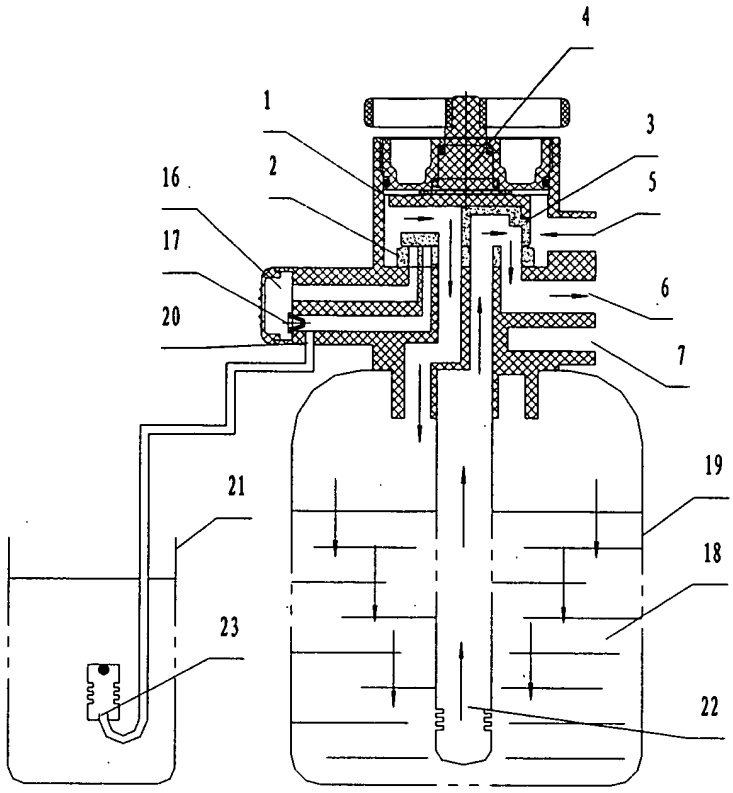

FIG. 4

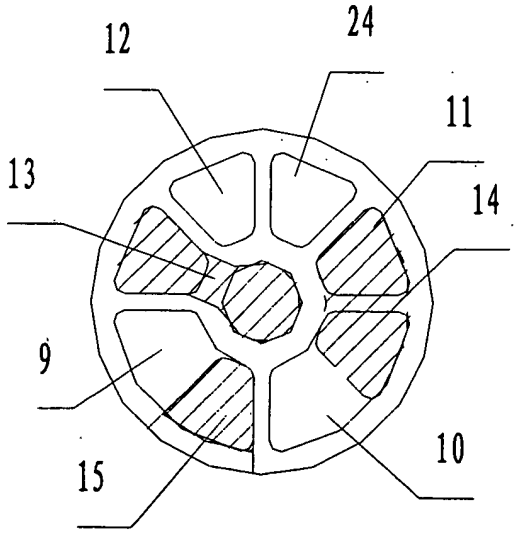

FIG. 5

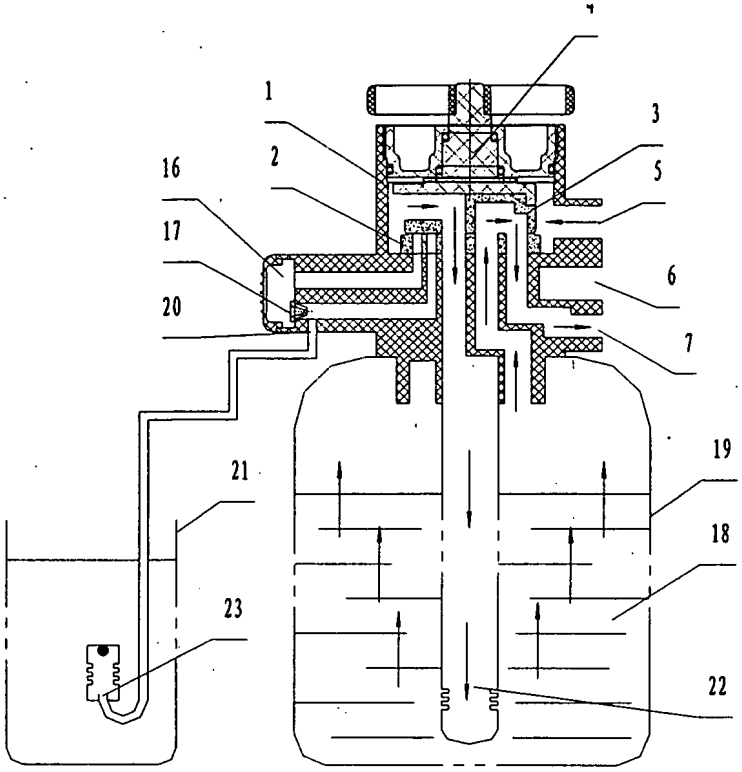

FIG. 6

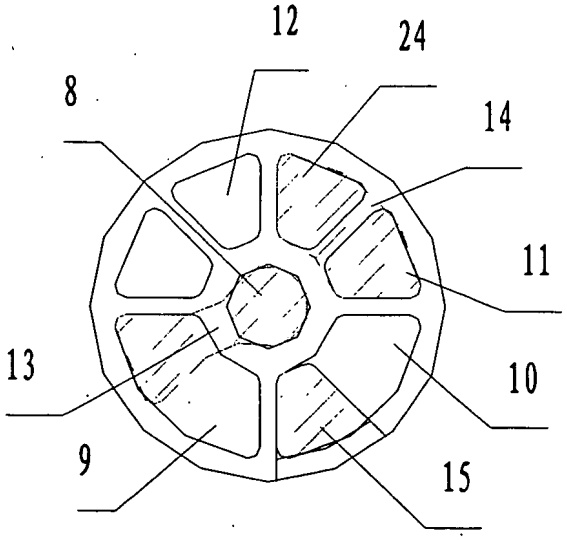

FIG. 7

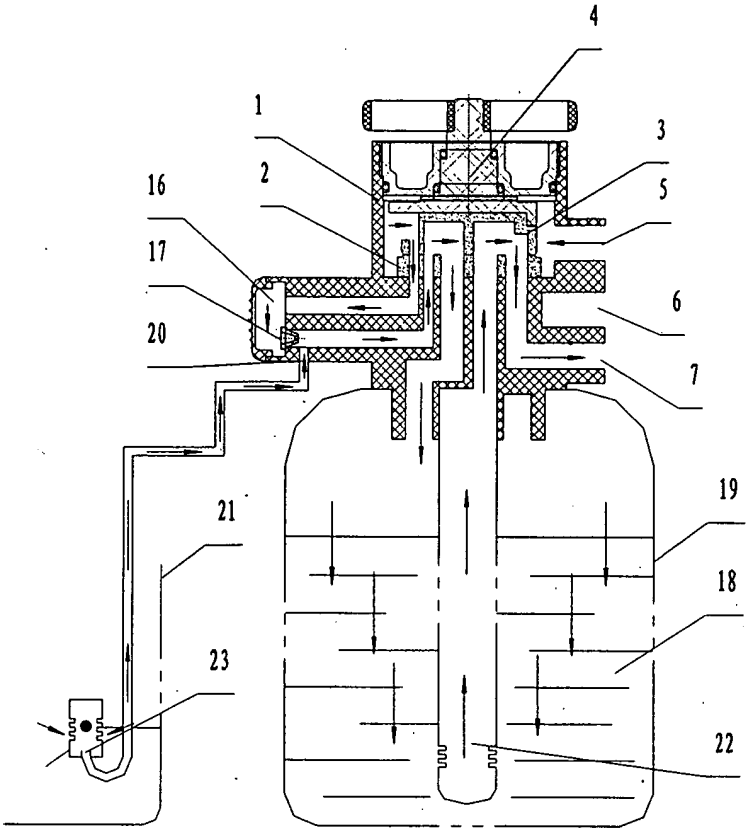

FIG. 8

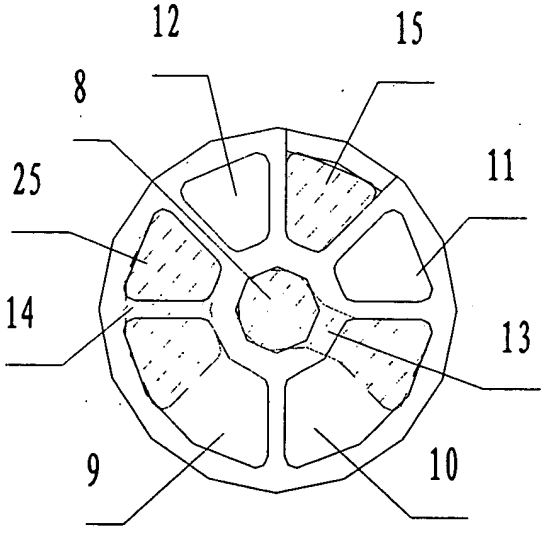

FIG. 9

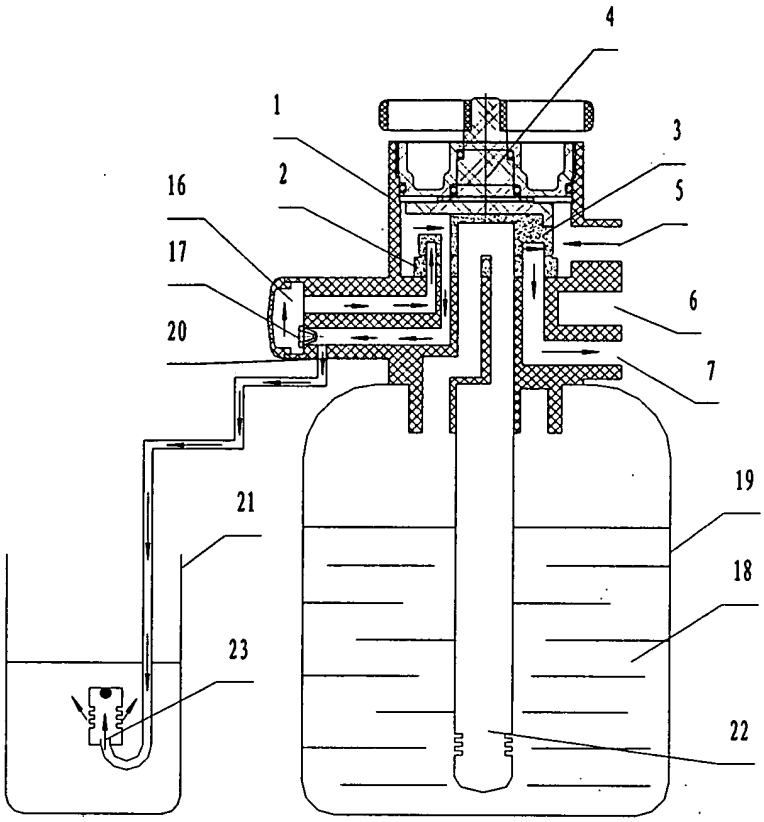

FIG. 10

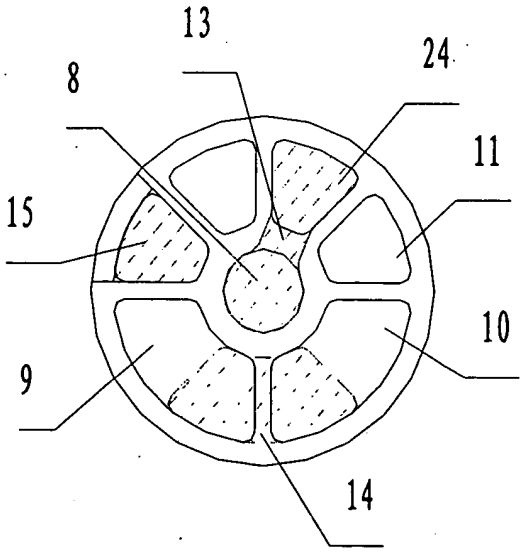

FIG. 11

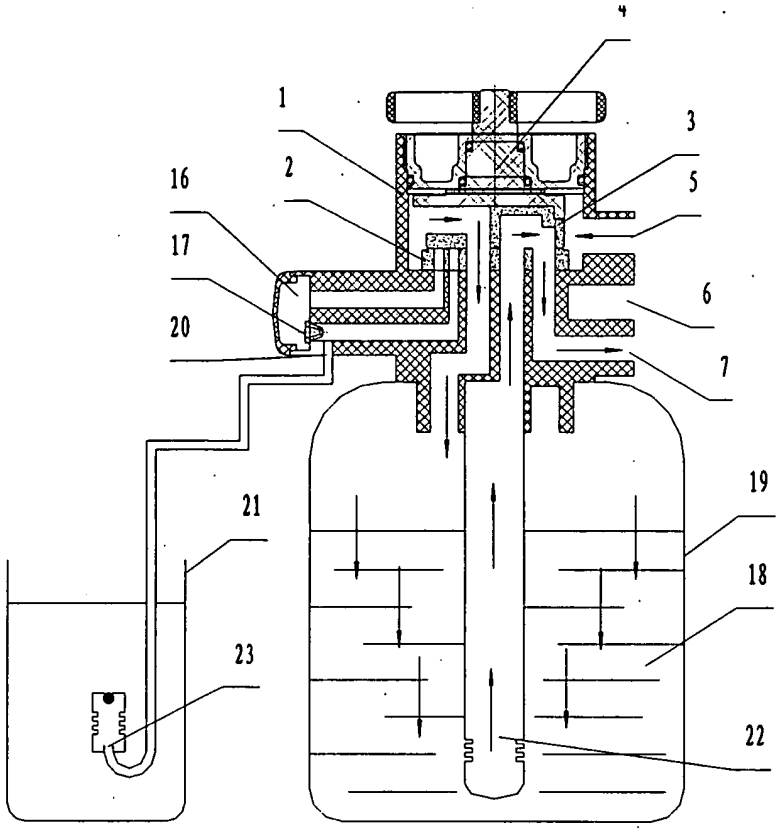

FIG. 12

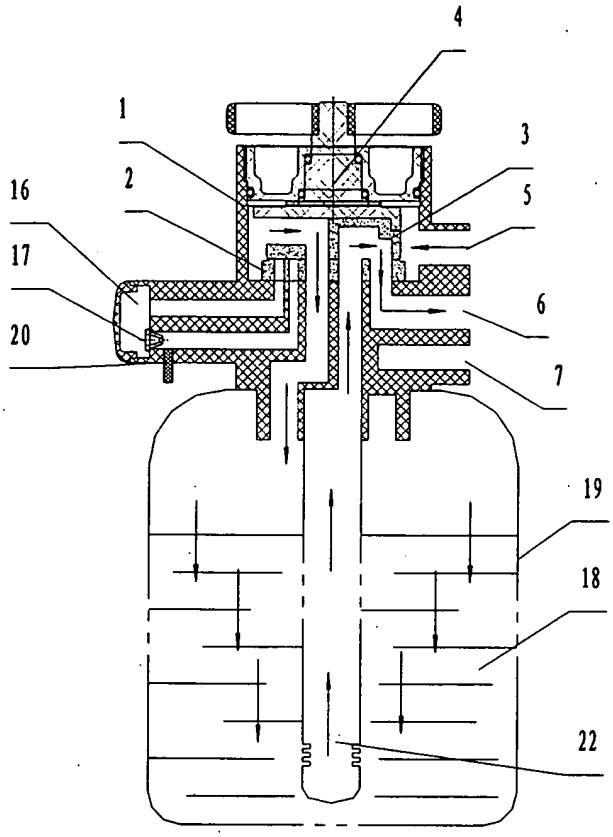

FIG. 13